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Comparison of stool antigen and urea breath test (UBT) methods for detection of *Helicobacter pylori* infection and the risk factors

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Abstract

The objective of the study is to compare between stool antigen and Urea Breath test method for detection of *Helicobacter pylori* which associated with several upper gastrointestinal disorders. This study ware carried out in 100 patients who visited B & C Teaching Hospital from 1st September 2017 to 30th November 2017. Containing 68 females and 22 males, their aged ranged from 12 to 80 years. The data were obtained by questionnaire. The stool samples were analyzed for *H. pylori* antigen using Premier Platinum *H. pylori* a stool antigen, enzyme immunoassay kit, while UBT test done by the Urea Breath analyzer from Shenzen Zhonghe Headway Bio – Sci & Tech Co., Ltd. Results of this study showed that prevalence of the infection increased with age greater than 40 years. Drinking water resources, tea drinking status were asked by a self-administered questionnaire. Results of this study showed that there was a significant correlation between, drinking tea also the type of drinking water consumed and *H. pylori* infection. *H. pylori* infection showed no significant correlation with sex

Keywords: Stool antigen and Urea Breath Test, *H. pylori*, Risk factor

Introduction

Helicobacter pylori (*H. pylori*) are a gram-negative bacterium found on the luminal surface of the gastric epithelium. It was first isolated by Warren and Marshall in 1983. It induces chronic inflammation of the underlying mucosa. The infection is usually contracted in the first few years of life and tends to persist indefinitely unless treated. At least 50% of the world's population is thought to carry *H. pylori*. The organism can survive in the acidic environment of the stomach partly owing to its remarkably high urease activity. Urease converts the urea present in gastric juice to alkaline ammonia and carbon dioxide [1].

Although the full spectrum of pathogenesis is currently unknown, *H. pylori* has been linked to a variety of upper gastrointestinal disorders. Reported symptoms of *H. pylori* infection are relatively non-specific, such as epigastric pain, postprandial fullness, bloating, nausea, and vomiting, along with signs of acid hypersecretion and delayed gastric emptying [2,3]. In addition, infection with *H. pylori* is linked to three important upper gastrointestinal diseases: duodenal or gastric ulcers, gastric cancer, and gastric mucosa-associated lymphoid-tissue lymphoma.

Many invasive and non-invasive methods can be used to diagnose *H. pylori* infection, including endoscopy with biopsy, serology for immunoglobulin titers, stool antigen analysis, and the urea breath test (UBT). Given the user-friendly, non-invasive features of UBT, this detection method may be preferred in many clinical settings.

UBT can play a useful role in the diagnostic evaluation of dyspeptic patients who have comorbidities that increase their risk of upper endoscopy, are intolerant to upper endoscopy, or have known or suspected gastric atrophy. Stool antigen testing can also be used to non-invasively detect active *H. pylori* infection, and the choice of diagnostic modality depends on factors such as cost, laboratory infrastructure, and concomitant use of medications such as proton pump inhibitors or antibiotics that may influence test results. Serum antibody test results can vary by geographic region, and may stay positive for a prolonged period following *H. pylori* eradication, thereby limiting the clinical utility for determining the presence or absence of current infection [4].

There are two UBTs available and gained Food and Drug Administration approval: ^{13}C and ^{14}C tests. Both tests are affordable and can provide real-time results. Some physicians may prefer the ^{13}C test as it is non-radioactive compared to ^{14}C which uses a radioactive isotope, especially in young children and pregnant women, though dose of radian is very minimal (about 1 microCi) [5]; the dose of radiation is the dose of ^{14}C-UBT with the mini dose equals to 1 microCi (37 kbq) which has a high diagnostic accuracy [6]. UBT is indicated to confirm *H. pylori* colonization and to monitor its eradication. Positive UBT indicates an active *H. pylori* infection which requires treatment or further confirmation with invasive procedures. Initial treatment for *H. Pylori* consist of either triple, quadruple, or sequential therapy regimens, which all of them includes a proton pump inhibitor plus various antibiotic regimen; treatment periods generally varied from 7 to 14 d [4]. The present study was therefore planned for comparative evaluation of stool antigen test and Urea Breath Test methods detection by a commercially available kit for diagnosis of *H.pylori* infection in cases of dyspepsia and risk factors.

Materials and Methods

Study population

A cross-sectional sero epidemiologic study was carried out in B & C Teaching Hospital Birtamode Nepal. The study period was September 1st, 2017 to November 30th, 2017. The total study population was 100 patients that chosen from Hospital in patients and out patients viching in B & C Teaching Hospital. The history of the patients was recorded in a predesigned data collection sheet.

Fig : UBT Analyzer and test card

Questionnaire

A trained Clinician and Laboratory Personel interviewed each patient and completed a detailed questionnaire. The questionnaire was designed to obtain demographic data and socioeconomic status was also assessed.

Results

The current investigation included 100 patients their ages ranged between 12 to 80 years. The prevalence of H. pylori infection was defined according to the different demographic data of the patients, including gender and age. Among the 100 patients who completed data, the highest positive result was found in the age group of 41-80yr (80%) and (60%) which detected by Urea Breath test and Stool antigen test respectively, while the highest negative result was found in the age group of 19-40yr (30.9.%) and (54.4%) which detected by Urea Breath Test and stool antigen test respectively (Table1).The highest positive result was in female and it constituted 76.4% and 50%in both UBT and stool antigen test methods respectively. while in male it constituted 68.7% and 43.7% in both UBT and stool antigen test methods respectively . There were no significant statistical results related to age or sex to be considered as a risk factor (Table1). The tested cases included 32 males (32%) and 68 females (68%).

Risk factors were assessed in the current study among the 100 patients with gastric affection including drinking tea and drinking water. The prevalence of infection among patients who usually consumed tap water or well water during livelihood 73.7% compared with 47.9% among those who usually consumed filtered water. The drink of tea had a strong effect on the prevalence of H. pylori infection. The prevalence of infection among patients who drink tea was % compared with % among those who not drink tea Table 2.

Table.1 Show the prevalence of infection in different age groups

Variable		Stool Test				UBT			
		Positive		Negative		Positive		Negative	
		No	%	No	%	No	%	No	%
Age (Years)	12- 20	07	58.3	05	41.7	09	75	03	25
	21 -40	31	45.6	37	54.4	47	69.1	21	30.9
	41- 80	12	60	08	40	16	80	04	20
Sex	Female	52	76.4	16	23.5	34	50	34	50
	Male	22	68.7	10	31.2	14	43.7	18	56.2

Discussion

UBT is a noninvasive test for diagnosis of gastric *H. pylori* infection. Twenty-three studies for both UBT ^{13}C and ^{14}C for detection of *H. pylori* infection in adults were included. The result of the meta-analysis showed that the test performance was high and the test has significant discrimination power between those who have the infection and those who haven't.

The present study was undertaken to compare the different diagnostic methods, UBT and stool antigen test methods for detection of *H. pylori* infection in patients with Acid peptic disease. The current study included 100 patients with upper GIT symptoms proven to be with gastric affection in the form of Acid peptic disease, that chosen from different B & C Teaching Hospitals .

Ages of the study participants ranged between 12 and 80 years. There was association between 41-80 years age group and infection density, though it did not reach statistical significance (Table 1). These results were comparable to European studies which reported correlation between age and gastric affection [7,8]; however, these studies found increased prevalence of gastritis and H. pylori colonization with increasing age. Furthermore Jones et al [10] observed that more complaints of dyspepsia in the older age group and suggested that the older subjects were probably more concerned about their health or were afraid of more serious underlying diseases. They further concluded that this may be of advantage, inthat severe diseases could be detected early and management instituted promptly. Regrettably, there was no study on stool antigen test from developing countries of the world to compare our study with. Our study also agreed with Nulty which found that the more likely age of infection in patients over 50 years old (42%) than in younger patients (21%) , another group of Liston cited by Nulty, found that (31.7%) of elderly patients with seropositive result had no evidence of active infection determined by endoscopy and urease test. Older patients are more likely to have developed atrophic gastritis and *H. pylori* can not readily colonize this type of gastric mucosa [11]. It was recognized that prevalence of H. pylori infection increase with age in a symptomatic persons in developed countries and this tend to plateau at around the age of 60 years, related to socioeconomic status and ethnicity [12- 13].

In the present study higher level of H. pylori infection was observed among female patients in UBT and stool antigen test methods (76.4% and 50%) rather than males (68.7% and 43.7%) respectively as shown in table 1. The slight preponderance of females in our study could reflect a greater consciousness in the issue of their health, or their ready presentation in the hospital could be due to emotional/psychosomatic disorders, which tend to be commoner among the female gender. In contrast to this study, Ihezuein the North-Central part of Nigeria, found that most of the dyspeptics (60%) were males and symptoms were commoner in those below the age of 40 years[13].

Table.2 Life style of Patient variables

		Positive		Negative	
		No	%	No	%
Drinking Water	Tap Wateer	28	73.7	10	26.3
	Purified Water	34	47.9	38	52.1
Drinking Tea	Yes	59	72.8	22	27.2
	No	13	68.4	6	31.6

In the present study, found that tea consumption is considered as a risk factor for *H. pylori* infection. The frequency of *H. pylori* infection in the tea consumer (%) and non-tea consumer (%) was significantly different in our study, this is compatible with results obtained by Endohwhich have analyzed the relation between tea consumption and *H.pylori* infection suggested that *H. pylori* infection significantly rose with tea consumption [14].

In the current study, the *H. pylori* infection rate was higher in patients who tap water (73.7 %) as compared to patients who used purified water (47.9%). This result is in agreement with other studies in developed and developing countries. They implicated the type of drinking water during childhood as the main risk factor for *H. pylori* infection. The microorganism is transmitted by the fecal-oral routs in the infected water to the child and persists through life and as the results showed that the type of drinking water during adulthood does not affect the infection rate.

We also found that the positive *H. pylori* infection which detected by stool antigen test was seen in 48% patients which is lower than Chisholm SA et al.[15,16] and Gisberg JP [17], this was due to more antigens present in stool in above study and they have more advance than us in diagnostic methods. Our study showed lower number of positive cases which may be due to insufficient amount of antigen in the stools. Difference of Pylori infection which detected by stool antigen test from other study is due to the difference of climate and may be quality of kit. This is also comparable to study by MahirGulcan et al [18] who reported positive result in 37 out of 80 children which was comparatively lower than this study.

The UBT test method showed greater number of positive cases (72%) than the stool antigen tests method (48%) which may be due to past infection. This is comparable to the study by Arora et al, who reported greater case detection by serology than by conventional tests. The patchy distribution of organism in the gastric mucosa may have resulted in a lower value for biopsy based test. Another factor could be the presence of gastric atrophy and intestinal metaplasia that are hostile to *H. pylori* [19]

Conclusion

In this pi study, UBT rapid diagnostic technique, stool antigen test, proved to be highly sensitive and specific for detecting *H. pylori* infection in in patients with dyspepsia and recurrent abdominal pain. Our results are comparable to those reported thus UBT test can replace endoscopy and biopsy for detecting *H. pylori* infection and UBT has high diagnostic accuracy for detecting *H. pylori* infection. The reliability of diagnostic meta-analytic estimates however is limited by significant heterogeneity.

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